

World Bank Reprint Series: Number 140

Gershon Feder

Alternative Opportunities and Migration: An Exposition and Evidence from Korea

Reprinted with permission from *The Annals of Regional Science*, vol. 13, no. 3 (November 1979), pp. 57-67, and vol. 14, no. 1 (March 1980), pp. 1-11.

ALTERNATIVE OPPORTUNITIES AND MIGRATION: AN EXPOSITION

Gershon Feder*

Abstract

This paper presents a simple migration model which traces the link between individual decision making and observed aggregate migration behavior. The model clarifies and demonstrates the role of alternative opportunities in aggregate migration behavior using both diagrammatical and mathematical presentations. It is shown that the definition of alternative opportunities does not necessarily depend on the distance between origin and destination.

I. Introduction

Traditional migration theory postulates that an individual's decision to migrate from his original residential location to a new and possibly distant place is based on a comparison of economic attributes characterizing the two localities. These attributes may be different for different individuals (depending on their age, sex, education, etc.) and thus the analysis of individual migration data must incorporate such relevant information. However, many studies have ignored the possibility that even though a migrant is observed to move between two specific locations, he actually considered some, or many other potential destinations which he eventually rejected. This hypothesis was propounded in a seminal article by Stouffer (7) and subsequently adopted in several migration studies (e.g., Bright and Thomas (1), Isbell (3), Strodbeck (9) and Stouffer (8)). The original formulation of the so-called "intervening opportunities" hypothesis argued that if an individual is observed to move from place i to place j , he must have considered the locations which lay on the way between origin and destination (hence their characterization as "intervening" locations). While Stouffer considered the number of residences in various locations as a proxy for the impact which these intervening opportunities may have had on observed migration behavior,¹ it was later recognized that more information on

*Development Research Center, The World Bank, Washington, D.C.
The author is indebted to Roger Norton for useful comments.

¹Isbell uses as a proxy the number of migrants (from all locations) arriving in any specific location.

alternative locations should be considered, and that the definition of what constitutes an intervening opportunity should be extended. Thus Miller (6) included locations which are away from the direct state-to-state migration route in his definition, and the recent works by Wądycki (10, 11) and Levy and Wądycki (5) consider economic characteristics of alternative destinations (e.g., employment and income) in their migration studies.

The latter works provide an excellent discussion as well as an empirical test of the intervening opportunities hypothesis. But several aspects of this topic can be illuminated further if a rigorous analytical structure relating aggregate migration behavior to its individual decision making components is constructed. This is a complicated task with a full-scale multi-location model. The present paper therefore deals with a mini-model, involving three locations only. This is the smallest acceptable number, since for migrants between any two points in this model, the third location can be shown to be an alternative to the destination actually chosen. This compromise in terms of size enables a diagrammatical presentation of the intervening opportunities concept as well as relevant insights with general implications.

II. The Model

In order to illustrate the role of intervening opportunities in the migration decision, a simplified model involving three locations is used. One location is viewed as the origin, and the remaining two are thus potential destinations. The origin population is composed of N individuals with identical levels of education and occupational skills. Each individual makes a decision whether he should stay at the origin or move to one of the two destinations. The decision is based on a comparison between expected incomes associated with each location.

Following the Fields (2) model, it is assumed that at any location j (where $j = 0, 1, 2$ denoting the origin and destinations 1 and 2, respectively) there are two types of jobs: A high wage job ("organized" sector job in Field's terms), with a corresponding income Y_j , and a low-paying subsistence type job ("murky" sector job), with a corresponding income S_j . While these incomes are applicable to any individual i ($i = 1, 2, \dots, N$) once he is on the job, (given the assumption of equal skills), it is not a certain matter whether the preferable "organized" sector job can be secured in any given location. Thus, there is a probability P_j that any individual, randomly chosen, could obtain a high paying job in location j . Since the subsistence type employment is assumed available without constraints, there is a probability $1 - P_j$ of winding up with a "murky" sector job in location j , if an individual chooses to reside there. The probability P_j is an objective probability, in the sense that it reflects the possibilities of employment in location j . Individuals, however, form their own perceptions of employment probabilities, based on the information available to them. This information is not necessarily accurate, thus the perceived probabilities may deviate from the objective probabilities. As a simplification, it is assumed that individuals are well informed regarding the situation in their home location (the origin), and therefore the subjective and objective probabilities in the origin

coincide,² and are denoted by P_0 . However, when locations 1 and 2 are considered, the subjective probability of securing a high paying job in either location may not only differ from the objective one, but is likely to vary among individuals, according to their differing exposure to information (through friends, relatives, public sources, etc.). That perceived opportunities do indeed vary among individuals of similar background is evident from the study by Jones and Zannaras (4). Therefore we denote the subjective probability of a "good" job in location j , as perceived by individual i , by p_{ij} , and it is assumed

$$p_{ij} = P_j^{\alpha_{ij}} \quad (j = 1, 2; i = 1, 2, \dots, N; 0 \leq \alpha_{ij}) \quad (1)$$

where the parameter α_{ij} (which is confined between zero and infinity) reflects individual's i deviation from the objective (true) probability. Individuals whose α_{ij} exceeds the value of 1 are pessimistic, since their perceived probability is lower than the real one. On the other hand, individuals whose α_{ij} is less than 1 perceive of opportunities which are better than the average, since in that case $p_{ij} > P_j$. In the limiting cases $\alpha_{ij} = 0$ indicates that individual i believes he has a good job in certainty, while $\alpha_{ij} \rightarrow \infty$ reflects a belief by the particular individual that he, personally, has no chance of getting a good job in location j . Obviously, α_{i1} and α_{i2} will generally be different. That is, the deviation from the objective probability for a given individual i , may be different between the two destinations. This reflects the fact that information regarding the two locations is not identical (e.g., a person may have relatives in location 1 but not in location 2).

As indicated above, the migration decision in the model is based on a comparison between expected income levels (net of migration costs) associated with the different locations. The expected incomes (denoted by Π_{ij}) for an individual i who currently resides in location 0 are (for locations 0, 1, 2 respectively)

$$\Pi_{i0} = P_0 Y_0 + (1 - P_0) \cdot S_0 \quad (2a)$$

$$\Pi_{i1} = p_{i1} Y_1 + (1 - p_{i1}) \cdot S_1 - C_1 \quad (2b)$$

$$\Pi_{i2} = p_{i2} Y_2 + (1 - p_{i2}) \cdot S_2 - C_2 \quad (2c)$$

where C_1, C_2 denote the cost of moving from origin 0 to destination 1 and 2, respectively.² It is reasonable to assume that this cost varies directly with the distance between the origin and the destinations. It is noted, from equation (2a) that expected income at the origin is the same for all individuals residing in the origin, and thus the index i can be dropped from Π_{i0} .

It is possible to characterize the individuals who will decide to move to destination 1, since for any such individual it must hold that both

²This assumption will facilitate a diagrammatic exposition of the model. Otherwise, it is not necessary to adopt such a constraint.

$$\text{and } \Pi_{i1} \geq \Pi_0 \quad (3a)$$

$$\Pi_{i1} \geq \Pi_{i2} \quad (3b)$$

namely, net income in destination 1 must exceed (or at least be equal to) incomes in the origin and in destination 2.

Denoting the group of individuals migrating to 1 from the origin by M_1 , the characterization in (3a) (3b) can be expressed (using (2a)-(2c) and (1)) as

$$P_1^{\alpha_{i1}} \cdot Y_1 + (1 - P_1^{\alpha_{i1}}) \cdot S_1 - C_1 > P_0 Y_0 + (1 - P_0) \cdot S_0 \quad (4a)$$

$$P_1^{\alpha_{i1}} \cdot Y_1 + (1 - P_1^{\alpha_{i1}}) \cdot S_1 - C_1 \geq P_2^{\alpha_{i2}} \cdot Y_2 + (1 - P_2^{\alpha_{i2}}) \cdot S_2 - C_2 \quad (4b)$$

Reorganizing conditions (4a) and (4b), one finally obtains the following characterization of individuals in M_1 :

$$\alpha_{i1} \leq \ln \psi_1 / \ln P_1 \quad (5a)$$

$$\alpha_{i1} \leq \ln (\theta_1 + \mu \cdot P_2^{\alpha_{i2}}) / \ln P_1 \quad (5b)$$

where

$$\psi_1 \equiv [C_1 - S_1 + P_0 Y_0 + (1 - P_0) \cdot S_0] / (Y_1 - S_1)$$

$$\theta_1 \equiv (C_1 - C_2 + S_2 - S_1) / (Y_1 - S_1) \text{ and } \mu \equiv (Y_2 - S_2) / (Y_1 - S_1)$$

In an analogous fashion, one can characterize the group of individuals migrating from the origin to destination two (say, M_2) by

$$\alpha_{i2} \leq \ln \psi_2 / \ln P_2 \quad (6a)$$

$$\forall i \in M_2$$

$$\alpha_{i2} \leq \ln (\theta_2 + \mu^{-1} \cdot P_1^{\alpha_{i1}}) / \ln P_2 \quad (6b)$$

where

$$\psi_2 \equiv (\psi_1 - \theta_1) / \mu$$

$$\theta_2 \equiv -\theta_1 / \mu$$

Using (5a, b) and (6a, b), the diagrammatic exposition of the model is straightforward (see Figure 1). In the positive quadrant of the $(\alpha_{i1}, \alpha_{i2})$ space, constraints (5a) and (6a) (with a strict equality) are expressed as the horizontal and vertical lines. Any individual i with a combination $(\alpha_{i1}, \alpha_{i2})$ which lies in the north-east direction of the intersection point X^* is obviously a non-migrant, since he does not satisfy (5a) and (6a). Constraints (6b) and (5b), which are in fact a single constraint (one could be derived from the other), are

effect) and because the decision "not to migrate" is relatively more attractive (the "expansion" effect). In fact, the model points out that the concept of alternative opportunities may include all destinations, be they located closer or farther (in terms of distance) than the particular destination considered. This can be deduced from the fact that the substitution effects $\partial M_1 / \partial Y_2$, $\partial M_1 / \partial P_2$ are strictly negative regardless of whether $C_2 > C_1$ or $C_1 > C_2$. Since a portion of the cost of migration can be viewed as a linear function of the distance covered by the migrant, a higher C_j could be taken as an indication of larger distance. Thus, assuming that location 2 is twice as far as location 1 does not necessarily imply that location 2 is not an alternative to location 1. Given a reasonably well dispersed distribution of $(\alpha_{11}, \alpha_{12})$ values there are two conditions for destination 2 to be considered as an alternative to destination 1. These are: a) that $Y_2 - C_2 > \Pi_0$, which is a trivial condition, implying that the net income from a secured good job in 2 exceeds average income in the origin; b) $Y_2 - C_2 > S_1 - C_1$, which implies that the net income from a secured good job in location 2 has to exceed the net income of low paying jobs in location 1. These conditions ensure that there will be at least some individuals for whom migration to destination 2 is preferred. But it is obvious that the condition $C_2 < C_1$ is not necessary for destination 2 to be viewed as an alternative opportunity.

Wadycki (10) indeed proposes a definition of alternative opportunities (in addition to two other definitions) which would include all locations (other than origin and destination) as initial potential alternatives (they are then to be screened for "best" alternatives). But he then discounts the appropriateness of this definition arguing that it is not likely that migrants have information on all locations. While information undoubtedly diminishes with distance, the choice of any particular distance (such as the distance between origin and destination) as a cut-off point may imply loss of relevant data when estimating a migration function. One indication for the availability of information can be the observed pattern of migration. That is, all locations which receive migrants from a given origin are obviously alternatives to each other regardless of distance, since some information on these locations was available to individuals originally residing in one location. This does not necessarily imply that locations which did not receive migrants from a given origin should be excluded from the list of alternatives, as the absence of migration may simply indicate that that particular alternative destination was not attractive enough for all individuals of a given origin.

Another point which can be inferred from the simple model above relates to cross-migration flows. Since the distribution of α_1 values over the population of location 0 is independent of the distribution of α_0 values over the population of location 1 (viewing now location 1 as an origin and location 0 as a destination), there is no theoretical reason to exclude migration flows going both ways between the two locations. This may be true even when the objective opportunities in one of the two locations are markedly better than in the other location, since there may be some individuals whose subjective assessment is significantly biased in favor of the location which is objectively inferior.

IV. Conclusions

This paper presents a simple migration model which demonstrates the role of alternative opportunities in the individual migration decision as well as in the aggregate migration behavior. The model confirms the hypothesis that alternative opportunities are a component in the migration relation which connects any specific origin and destination, and thus enhances the view that such factors should be accounted for in empirical estimations of migration functions. Moreover, the model implies that the definition of alternative opportunities should be extended to include locations which are further away than the particular destination considered.

APPENDIX

Comparative Static Results

Differentiation of (5b) (maintained at strict equality) yields (where α_{i2} is held constant at the point of differentiation)

$$\frac{\partial \alpha_{i1}}{\partial Y_1} = -1/[Y_1 - S_1] \cdot \ln P_1 > 0 \quad (\text{A.1})$$

$$\frac{\partial \alpha_{i1}}{\partial S_1} = (P_1^{\alpha_{i1}} - 1)/[P_1^{\alpha_{i1}} \cdot (Y_1 - S_1) \cdot \ln P_1] > 0 \quad (\text{A.2})$$

$$\frac{\partial \alpha_{i1}}{\partial C_1} = 1/[P_1^{\alpha_{i1}} \cdot (Y_1 - S_1) \cdot \ln P_1] < 0 \quad (\text{A.3})$$

These results imply that increases in income levels Y_1 and S_1 , and a reduction in the migration cost C_1 , will cause an upward shift of all points on the AX^* curve (Figure 1). Therefore, these changes cause an increase in migration to destination 1 and a decline of migration to 2 (i.e., $\partial M_1/\partial Y_1 > 0$; $\partial M_1/\partial S_1 > 0$; $\partial M_1/\partial C_1 < 0$; $\partial M_2/\partial Y_1 < 0$; $\partial M_2/\partial S_1 < 0$; $\partial M_2/\partial C_1 > 0$).

$$\frac{\partial \alpha_{i1}}{\partial P_2} = (\mu \cdot P_2^{\alpha_{i2}-1} \cdot \alpha_{i2})/P_1^{\alpha_{i1}} \cdot \ln P_1 < 0 \quad (\text{A.4})$$

$$\frac{\partial \alpha_{i1}}{\partial Y_2} = P_2^{\alpha_{i2}}/[Y_1 - S_1] \cdot P_1^{\alpha_{i1}} \cdot \ln P_1 < 0 \quad (\text{A.5})$$

$$\frac{\partial \alpha_{i1}}{\partial S_2} = (1 - P_2^{\alpha_{i2}})/[Y_1 - S_1] \cdot P_1^{\alpha_{i1}} \cdot \ln P_1 < 0 \quad (\text{A.6})$$

$$\frac{\partial \alpha_{i1}}{\partial C_2} = -1/[(Y_1 - S_1) \cdot P_1^{\alpha_{i1}} \cdot \ln P_1] > 0 \quad (\text{A.7})$$

show, in terms of Figure 1, that these changes imply a south-west move of point X^* along the old AX^* curve⁷ (the slope and location of which remains unchanged except for the end point X^* which is now lower, say X^{**}). Thus the total area representing non-migrants increases while the area representing M_1 and M_2 shrinks, as demonstrated in Figure 3, where the shaded areas represent the reduction in migration flows.

Since it was demonstrated that increases in Y_1 , S_1 , P_1 and $-C_1$ have a negative impact on M_2 , it follows, on grounds of symmetry, that increases in Y_2 , S_2 , P_2 and $-C_2$ are negatively related to M_1 (these results are also verified mathematically in the Appendix). The migration function between the origin and destination 1 should thus be formulated as

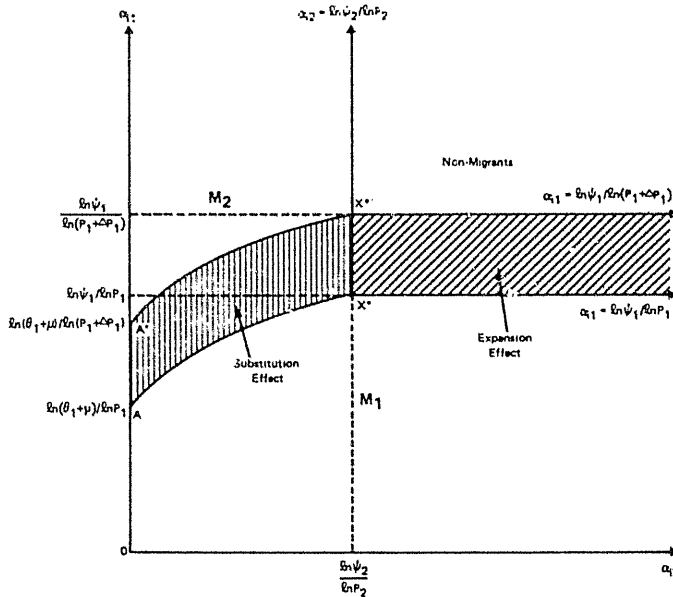
$$M_1 = f(Y_0, S_0, P_0, Y_1, S_1, P_1, C_1, Y_2, S_2, P_2, C_2) \quad (7)$$

Most studies of point to point migration tend to ignore the last four right-hand side variables (or more generally, the variables which represent intervening opportunities). Notable exceptions include the works of Levy and Wadycki (5) and Wadycki (10, 11) who included in their migration equations variables representing some of the intervening opportunities.

Considering a situation where there are many locations (rather than the three in the present simplified model), a question may be raised as to whether all locations should be considered as alternative opportunities for a given destination. Stouffer (8) and others defined intervening opportunities rather narrowly as the locations lying physically between the origin and the specific destination considered. But, as pointed out by Miller (6, p. 476) "...a rational man, in considering migration to a distant city, would consider only whether there were any suitable opportunities closer, not whether these opportunities lay physically between him and the more distant city." Thus the concept of "intervening" opportunities should be replaced by "alternative" opportunities which include locations within a circle around the origin, the radius of which is equal to the distance between the origin and the specific destination considered. It follows, then, that the closer is the destination, the smaller is the number of alternative opportunities involved. But, as the present model points out, a smaller distance to a destination does not reduce the number of alternative opportunities. Rather, it diminishes the relative attractiveness of all alternative opportunities (this is the implication of $\partial M_2 / \partial C_1 < 0$). Similarly, migration to a more distant location is smaller, *ceteris paribus*, not because there are more alternative opportunities to be considered, but because the relative attractiveness of any alternative destination has increased (the "substitution"

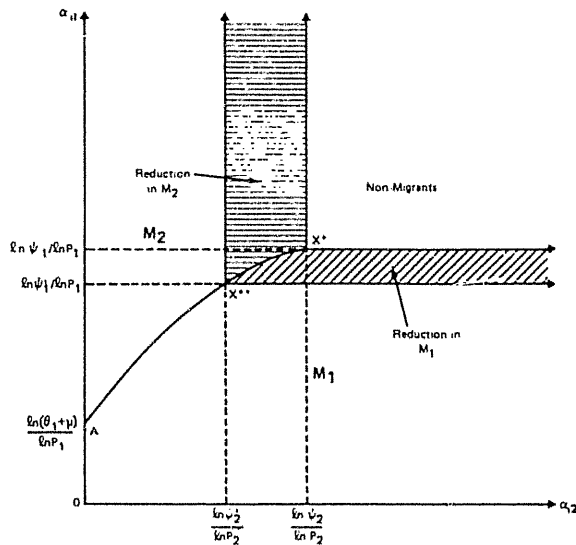
⁷ Inspection of (5b) (when maintained with strict equality confirms that the parameters Y_0 , S_0 and P_0 (describing the origin's economic opportunities) are not involved in determining the shape or location of the AX^* curve. The endpoint X^* , given by the coordinates $(\ln \psi_2 / \ln P_2, \ln \psi_1 / \ln P_1)$, is relocated now down the curve, since both $\ln \psi_2 / \ln P_2$ and $\ln \psi_1 / \ln P_1$ decline in value as a derivation of (5a), (5b) shows.

FIGURE 2: THE IMPACT OF IMPROVED ECONOMIC OPPORTUNITIES IN DESTINATION 1



World Bank - 20306

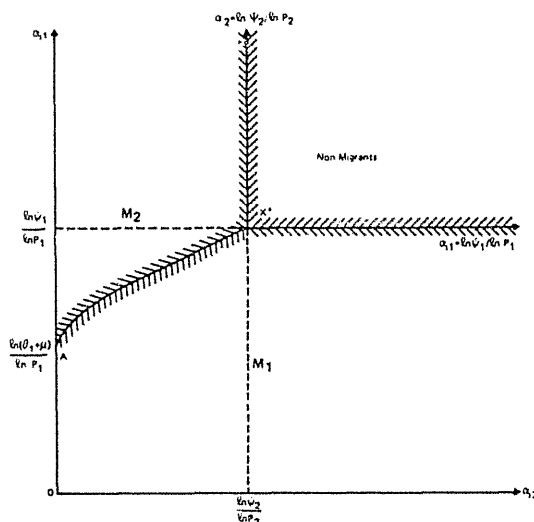
FIGURE 3: THE IMPACT OF IMPROVED ECONOMIC OPPORTUNITIES IN THE ORIGIN



World Bank - 20307

described (when expressed as a strict equality) by the curve AX^* .³ All individuals with $(\alpha_{i1}, \alpha_{i2})$ combinations lying to the right of AX^* belong to M_1 , while all $(\alpha_{i1}, \alpha_{i2})$ combinations lying above AX^* belong to M_2 .⁴

FIGURE 1: A DIAGRAMMATICAL EXPOSITION OF THE MODEL



World Bank - 20305

While one could conceive of extreme situations such that one of the migration flows (M_1 or M_2) is zero, the general case is (provided that the distribution of $(\alpha_{i1}, \alpha_{i2})$ is sufficiently dispersed) that there will be positive flows to both destinations as long as the 'good' job's income minus migration costs exceeds average income in the origin (i.e., $Y_j - C_j > \bar{Y}_0$, $j = 1, 2$).

III. Implications of the Model

Several straightforward comparative static results can now be deduced using Figure 1. First, it is noted that any parametric change which causes a

³That the curve implied by (6b) (or (5b)) does indeed pass through the intersection point X^* can be confirmed by simply inserting $\alpha_{i2} = \ln \psi_2 / \ln P_2$ in (5b). The sign of the slope of AX^* is confirmed by differentiating (5b) (when expressed as a strict equality) obtaining

$$d\alpha_{i1}/d\alpha_{i2} = \mu P_2^{\alpha_{i2}} \ln P_2 / [(\theta_1 + \mu P_2^{\alpha_{i2}}) \cdot \ln P_1] > 0.$$

⁴It should be noted that point A could lie on the α_{i2} axis if $Y_2 - C_2 > Y_1 - C_1$.

north-east shift in the position of point X^* implies an increase in the overall rate of out-migration. Using conditions (5a) and (6a) it is easy to verify that such changes include increases in P_j , Y_j and S_j ($j = 1, 2$) and reductions in P_0 , Y_0 , S_0 , C_1 , and C_2 . In other words, improvement of the economic opportunities in any of the destinations, a reduction in transportation and migration costs or worsening economic conditions at the origin are all causes of increased out-migration. These are standard results of migration theory. Another set of standard results involves the factors affecting migration flows to a specific location, say destination 1: As has been argued in numerous studies, one would expect the flow of migration from the origin to destination 1 to be positively affected by higher income levels and employment probabilities at 1, while being adversely affected by higher incomes and employment probabilities at the origin. In addition, a higher migration cost (or a higher distance) has a deterring effect on the destination-specific migration flow. All these predictions are confirmed by the model: Consider first an increase in P_1 , (objective probability of finding a higher paying job). In terms of Figure 1, points X^* and A move upward⁵ and, thus, the whole X^*A curve moves upward and the area representing M_1 is increased, implying an increase in migration from the origin to location 1 (provided there are no significant "holes" in the distribution of $(\alpha_{11}, \alpha_{12})$). But the same result implies also that some migrants who would otherwise be headed to destination 2 will now be going to 1 as the latter's relative attractiveness has increased. This is the essence of the intervening opportunities hypothesis, namely, the migration flow between two locations is affected not only by the economic conditions in the origin and destination, but also by conditions in all other potential locations considered by migrants. The increased flow of migrants to location 1 due to the improvement in opportunities is thus composed of two components: (i) a pure "expansion" effect involving individuals who would not have migrated anywhere prior to the improvement in location 1 economic situation; (ii) a "substitution" effect involving individuals who would otherwise be going to destination 2. These components are demonstrated in Figure 2, where A' and X^* represent the situation with the higher probability of good jobs in location 1.

A similar analysis applies when increases in income levels of destination 1 (Y_1 and S_1), or a reduction in the cost of migration C_1 , are considered. In each one of these cases points A and X^* move upward and the new AX^* curve lies above the old one, producing the same effects as an increase in P_1 ,⁶ namely, an increase in overall outmigration, an increase in migration to destination 1 and a reduction in migration to destination 2.

An improvement in the economic conditions prevailing in the origin (i.e., increases in Y_0 , S_0 , and P_0) will reduce the overall rate of out-migration as well as decrease the migration flow to each one of the destinations. One can

⁵The new curve does not intersect the original one since, by derivation of (5b), one can show

$$d\alpha_{11}/dP_1 = -\ln(\alpha_1^* + \mu P_2^{\alpha_{12}})/[P_1(\ln P_1)^2] > 0.$$

⁶See Appendix for the mathematical derivation of these results.

ALTERNATIVE OPPORTUNITIES AND MIGRATION: EVIDENCE FROM KOREA

Gershon Feder*

Abstract

The paper emphasizes the relevance of alternative opportunities in migration research and suggests a method for representing such opportunities in empirical studies. The suggested approach aggregates the different alternatives using weights which are distance-dependent such that the weights decline with larger distances. This method is applied to Korean migration data from which a migration-allocation model is estimated. The results support both the alternative opportunities hypothesis and the particular way for incorporating their influence as suggested in this paper.

1. Introduction

In a seminal article published almost four decades ago, Stouffer [10] emphasized that while an individual is observed to move from a place of origin to one particular destination, he actually may have considered a number of other potential destinations (labeled "Intervening Opportunities") which were eventually rejected. This proposition has important implications for empirical analyses of migration patterns, as the attributes of these alternative opportunities must be incorporated in the study as well as the characteristics of the origin and the actual destination. Stouffer hypothesized that only localities lying between the origin and the observed destination are considered as alternatives, and he accounted for the impact of these locations by including the number of residences in each location in the analysis (Stouffer [11]). The intervening opportunities hypothesis was adopted in a number of studies during the 40s (e.g., Bright and Thomas [2], Isbell [4], and Strodtbeck [12]) who used various indicators to represent the influence of these opportunities, such as the number of alternatives or the number of migrants arriving in each location.

While these works undoubtedly advanced the quality of migration research, it was pointed out by Miller [7] that it is not reasonable to assume that migrants search in one direction only.

*Development Research Center, The World Bank, Washington, D.C. I am indebted to Bertrand Renaud for useful discussions and advice regarding data. Ms. Malathi Parthasarathy provided valuable assistance in computations. The views expressed in this paper are those of the author and do not necessarily reflect the views of the World Bank.

Thus, locations which are outside the direct point-to-point migration route (and in particular locations in the opposite direction) should not be excluded. These considerations were elaborated upon and tested in the excellent works of Levy and Wadycki [5] and Wadycki [13, 14]. Starting with the premise that information diminishes with distance, they hypothesize that if a migrant moves from place i to place j over a distance D_{ij} , he is likely to have had information regarding all locations within the same distance. This implies that for any given origin i and any actual destination j , all locations within the radius D_{ij} are alternatives which may have influenced the migrant's decision. The same attributes characterizing the origin and destination (income, unemployment, population) need then be included for the alternative opportunities. This poses then an econometric problem as there may be many such alternatives, implying many right-hand-side variables in the migration equation. The solution adopted by Levy and Wadycki was to screen the alternatives and to select the "best" values for each attribute (e.g., highest income, lowest unemployment, etc.). Regressions using these procedures for Venezuelan and U.S. data produced plausible results, and in particular, it was shown that the variables representing alternative opportunities have a significant negative impact on migration allocation, and that their inclusion reduced the measured influence of distance which would be implied by a model excluding alternative opportunities.

A recent article by Feder [3] argues that further improvements in the estimation of migration functions may be realized if the set of alternative opportunities is expanded to include all potential destinations regardless of distance. The reasoning (based on a mathematical migration decision model) was that while distance reduces the attractiveness of distant alternatives it does not necessarily eliminate them from the migrants' considerations. It was further suggested as a practical guide that if a location k receives migrants from an origin i , then k should be considered as an alternative to any destination j which receives migrants from i .

Indeed, Wadycki [14] tried to use all locations as an initial set of alternative opportunities, but his estimates did not provide strong support for this approach. His test cannot, however, be taken as a conclusive judgment since the method of selecting the "best" alternative implies that the same locations are the best alternatives for almost all destinations, and the alternative opportunities variable has very little variation. Thus, inclusion of the best opportunity variables in the migration equation resulted in a substantial loss of statistical significance for the constant term [Wadycki, [14], table 1], which could be expected when a variable with minimal variation is included on the right hand side of a regression equation.

The present paper uses Korean 1974 inter-provincial migration data to test the broader definition of the alternative opportunities hypothesis. Instead of selecting a "best alternative" (which leads to econometric problems as indicated above), all alternative opportunities are aggregated using a weighting system

These results imply that improvements of the economic opportunities in destination 2 (i.e., increases in Y_2 , S_2 and P_2) or a reduction in the cost of migration to that particular location (decline of C_2) will cause a downward shift in the AX^* curve of Figure 1 (as well as a movement of point X^* to the right). These changes thus imply a decline of migration to destination 1 and an increase in migration to destination 2 (i.e., $\partial M_1 / \partial P_2 < 0$; $\partial M_1 / \partial Y_2 < 0$; $\partial M_1 / \partial S_2 < 0$; $\partial M_1 / \partial C_2 > 0$).

REFERENCES

1. Bright, M. L. and D. S. Thomas, "Interstate Migration and Intervening Opportunities," American Sociological Review 6 (December 1941), pp. 773-783.
2. Fields, G. S., "Rural-Urban Migration, Urban Unemployment, and Job Search Activity in LDC's," Journal of Development Economics 2 (February 1975), pp. 165-187.
3. Isbell, E. C., "Internal Migration in Sweden and Intervening Opportunities," American Sociological Review 9 (December 1944), pp. 627-639.
4. Jones, R. C. and G. Zannaras, "Perceived Versus Objective Urban Opportunities," American Sociological Review 9 (December 1944), pp. 627-639.
5. Levy, M. B. and W. J. Wadycki, "What is the Opportunity Cost of Moving? Reconsideration of the Effects of Distance on Migration," Economic Development and Cultural Change 22 (January 1974), pp. 198-214.
6. Miller, E., "A Note on the Role of Distance in Migration: Costs of Mobility Versus Intervening Opportunities," Journal of Regional Science 12 (December 1972), pp. 475-478.
7. Stouffer, S. A., "Intervening Opportunities: A Theory Relating Mobility and Distance," American Sociological Review 5 (December 1940), pp. 845-867.
8. Stouffer, S. A., "Intervening Opportunities and Competing Migrants," Journal of Regional Science 2 (April 1960), pp. 1-26.
9. Strodbeck, F. L., "Equal Opportunity Intervals: A Contribution to the Method of Intervening Opportunity Analysis," American Sociological Review 14 (August 1949), pp. 490-497.
10. Wadycki, W. J., "A Note on Opportunity Costs and Migration Analysis," Annals of Regional Science 8 (February 1974a), pp. 109-117.
11. Wadycki, W. J., "Alternative Opportunities and Interstate Migration: Some Additional Results," Review of Economics and Statistics 56 (May 1974b), pp. 254-257.

based on distance. Since only average income is used as an explanatory variable, a single measure of alternative opportunities emerges. This measure is incorporated in an estimate of a migration-allocation equation and the implications of the results are analysed and compared to previous studies.

11. The Model

Following the procedure used in Wadycki [13, 14] and Levy and Wadycki [5], a migration-allocation model is considered. Thus, A_{ij} is defined as the ratio of migrants from origin i to destination j relative to the total number of migrants moving out of i . In other words, A_{ij} is the conditional probability that a person from i will move to j , given that he is a migrant. As argued by Sjaastad [9] in such a model variables characterizing the origin are not relevant for explaining the destination decision.

It is assumed that migrants' choice of destination is based on a comparison of average per capita income levels characterizing the different provinces. Thus a province with a higher income level is expected ceteris-paribus to attract a larger share of the outmigration flow of a given origin, i.e., $\partial A_{ij} / \partial Y_j > 0$, where Y_j denotes per capita income to province j .

Distance has traditionally been an important factor in explaining migration patterns. Denoting the distance between the approximate geographical center of each province by D_{ij} , one would expect larger distances to discourage marginal migrants (both because of the direct cost of moving and because of the higher degree of uncertainty due to poorer information), thus the common result in migration studies is $\partial A_{ij} / \partial D_{ij} < 0$.

Inspection of the matrix of the 1974 interprovincial gross migration flows for Korea [Korea Bureau of Statistics, (15), pp. 128, 129] reveals that there are no empty cells in the matrix. This implies that for any origin and destination provinces out of the eleven provinces of Korea, there are nine alternative destinations which have been considered by at least some of the migrants. It is reasonable to assume that more distant alternatives are less attractive (i.e., their income level plays a lesser role in migrants' eventual decision with respect to a given final destination). Therefore, a procedure which aggregates the income levels of these alternative locations should attach lower weights to more distant places. The weighting method employed in the present study is as follows: Define $d_{ij} = 1/D_{ij}$, the inverse of distance. For any given pair of provinces i and j the sum $\sum_{k \neq i, j} d_{ik}^j$ describes the total of distance inverses. Define further the weights $\sigma_{ik}^j = d_{ik}^j / \sum_{k \neq i, j} d_{ik}^j$, $k \neq i, j$. It must hold that $\sum_{k \neq i, j} \sigma_{ik}^j = 1$, and the weights have the property that places which are more distant from the origin i carry a smaller weight, i.e., $\partial \sigma_{ik}^j / \partial D_{ik} < 0$. For any given origin i and destination j the sum of weighted alternative incomes is calculated as

$$Y_{ij}^* = \sum_{k \neq i, j} \sigma_{ik}^j Y_k \quad (1)$$

The variable Y_{ij}^* represents (weighted) "average alternative opportunities" confronting an individual who contemplates moving from i to j . The definition of the variable guarantees that income levels in closer locations will have a stronger impact on Y_{ij}^* , but distant locations with very high income levels may still have a significant effect.¹ Another plausible property of the alternative opportunities variable as specified above is the fact that it is not symmetric. That is, in general the situation $Y_{ij}^* \neq Y_{ji}^*$ will be observed. It is expected that Y_{ij}^* will be negatively related to A_{ij} ($\partial A_{ij} / \partial Y_{ij}^* < 0$), since the better are alternative opportunities, the smaller is the likelihood that an individual will prefer location j as a final destination.

While attempting to keep the model simple (as data on regional unemployment rates and other characteristics relevant for the year 1974 were not available), the special characteristics of the province of Seoul (which is essentially the country's capital Seoul and its suburbs) cannot be accounted for by the income variable only. The city of Seoul is the cultural and educational center of Korea.² As emphasized by Mera [6, p. 74], there is a strong link in Korea between education, job opportunities and upward mobility. Special importance is attached to degrees from high ranking universities (most of which are located in Seoul) and many parents believe that by moving to an area with top quality high-schools (which, again, are located mostly in the capital) they increase their childrens' chances of admittance to good universities. Such factors are accounted for in the present model by a dummy variable (say S) for migration into Seoul. It is expected that empirical results will yield a significant positive value for S , reflecting the special attraction of Seoul city. A detailed discussion of the data and the sources used for calculating all variables is provided in the appendix.

An important issue pertaining to estimation relates to the specification of the migration-allocation function. The Levy-Wadsky studies, which are the most relevant references for purposes of comparison with the analysis here, have used a double-log specification (i.e., a constant elasticity model). However, Renaud [8, p. 314] concuded on the basis of his empirical results that the constant elasticity assumption is not appropriate for analysis of Korean migration. For the sake of completeness, both a variable elasticity (semi-log) and a constant elasticity (double-log) model will be estimated. But it will be shown that Renaud's observation was indeed correct, as the variable elasticity (semi-

1

The use of distance-dependent weights in order to generate a single multi-location index as reported here is similar to the procedure employed by Alperovich et al. [1, p. 138]. The latter study uses as weights an inverse exponent of distance rather than the simple inverse used in the present paper, but the principle is identical.

²The ratio of higher education students to population in Seoul is 600% higher than that of the other provinces, and it contains half of the country's colleges and universities, while its share in the population is only 20%.

log) model explains much better the variability in migration allocation compared to the double-log form.

The equations to be estimated are thus:

$$A_{ij} = \alpha_0 + \alpha_1 \cdot \log Y_j + \alpha_2 \cdot \log D_{ij} + \alpha_3 \cdot \log Y_{ij}^* + S + \epsilon_{ij} \quad (2)$$

where the α 's are parameters and ϵ_{ij} is the error term. This equation will be referred to as the VE (variable elasticity) model.

$$\log A_{ij} = \beta_0 + \beta_1 \cdot \log Y_j + \beta_2 \cdot \log D_{ij} + \beta_3 \cdot \log Y_{ij}^* + S + \epsilon_{ij} \quad (3)$$

where again, the β 's are parameters and ϵ_{ij} is an error term. This equation will be referred to as the CE (constant elasticity) model.

In addition, it is of interest to examine a modified version of equations (2) and (3) where the constraints $\alpha_1 = -\alpha_3$ and $\beta_1 = -\beta_3$ are imposed. This implies a model with equal absolute effect of the income variables, and the rationale for it will be discussed below. The results are reported in Table 1.

III. Implications of the Results.

A number of observations can be made on the basis of these results:

The variable elasticity model seems to be a superior specification for Korean migration data, as it explains 21% more of the variation in the dependent variable. In fact, the advantage of the VE model is even more significant, as the R^2 for the constant elasticity model refers to the variation in $\log A_{ij}$, and the proper measure of fit (which should refer to variation of A_{ij} itself) is even lower. While the comparison between the R^2 's does not comprise a formal test, it does indicate (given the absence of a theoretically-based a-priori preference for any specification) that the VE model is a better approximation of the (unknown) true structure.

The signs of all coefficients are as expected and they are all statistically significant at a 5% (one-sided) confidence level. In particular, the alternative income opportunities variable is shown to have an impact which is not much different from that of the destination income variable in both the VE and the CE models. Thus the alternative opportunities hypothesis has been confirmed, as well as the hypothesis that a distance-weighted aggregate of all alternative opportunities is a proper summary representation of such opportunities. A further hypothesis asserting that the absolute impact of destination income and alternative opportunities income is identical (namely, that the variables Y_j and Y_{ij}^* should be introduced as a ratio $\log(Y_j/Y_{ij}^*)$) was investigated using F tests and was accepted for both specifications. The results of this version are reported in columns (3) and (4) of Table 1.

Comparing the results reported in columns (3) and (4) to those in columns (1) and (2), it is noted that the various coefficients remain practically unchanged. Thus the results indicate

TABLE 1
ESTIMATION RESULTS WITH SEMI-LOG AND
DOUBLE-LOG SPECIFICATIONS

Variable ^a	(1) VE model	(2) CE model	(3) VE model with $\alpha_1 = -\alpha_3$	(4) CE model with $\beta_1 = -\beta_3$
Constant	.2511 (8.79) ^c	-1.2778 (-3.32)	.2478 (11.20)	-1.2492 (-4.19)
Y_j	.1796 (5.27)	2.1421 (4.66)	-	-
D_{ij}	-.0854 (-7.93)	-.9813 (-6.75)	-.0859 (-8.20)	-.9776 (-6.92)
Y^*_{ij}	-.1984 (-2.30)	-1.9810 (-1.70)	-	-
S	.2824 (10.00)	1.2882 (3.72)	.2819 (11.09)	1.2925 (3.77)
Y_j/Y^*_{ij}	—	—	.1832 (6.58)	2.1111 (5.62)
R^2	.8125	.6026	.8124	.6025
DF ^b	105	105	106	106

^aAll explanatory variables except S were transformed into natural logarithms.

^bDegrees of freedom.

^cFigures in parentheses are 't' values.

that the model should be properly specified with equal absolute coefficients for the income variables (i.e., both the destination income and the alternative opportunities weighted income). Such a specification has considerable intuitive appeal, as it corresponds to an underlying individual choice model where the destination decision is based on income (or expected income) comparisons. Consider a hypothetical situation such that average income levels in all provinces are identical. Destination choice for migrants in such a situation should not be influenced by income levels,³ but rather should be dictated by distance (and other considerations such as education possibilities if relevant). This will indeed be the case if a specification using $\log(Y_j/Y^*_{ij})$ is adopted, and as the data support such a specification the model seems to be credible.

In order to compare the coefficients of the VE model to those of the CE model, the former need to be transformed into elasticities. Define

³Even with identical incomes, some migration will take place as subjective income assessments by some individuals may still differ from the average figure.

$$\eta_y^m = \frac{\partial A_{ij}}{\partial (Y_i/Y_{ij}^*)} \cdot \frac{(Y_j/Y_{ij}^*)}{A_{ij}} ; \quad \eta_d^m = \frac{\partial A_{ij}}{\partial D_{ij}} \cdot \frac{D_{ij}}{A_{ij}} ; \quad m = ve, ce \quad (4)$$

where η denotes elasticity, the subscripts y and d denote income and distance, respectively, and the superscripts ve and ce correspond to the variable elasticity (semi-log) and constant elasticity (double-log) models, respectively.

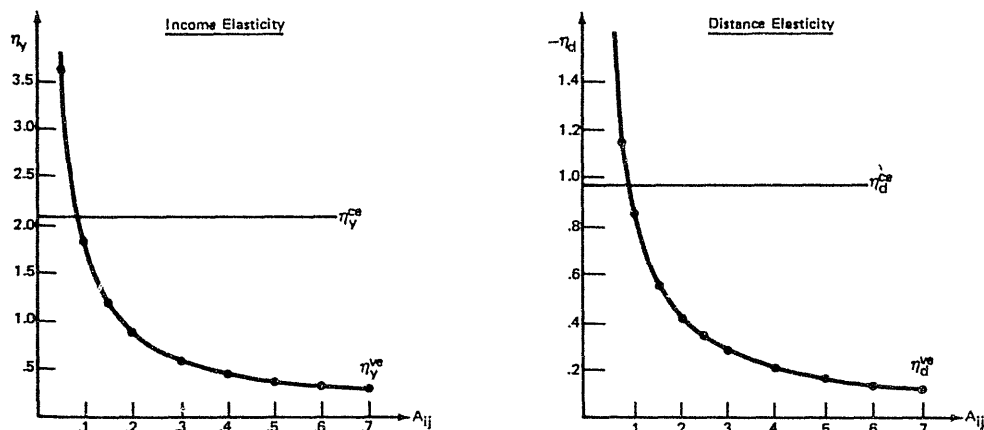
Following columns (3) and (4) of table 1, the corresponding numerical values are:

$$\eta_y^{ve} = .1832/A_{ij} \quad ; \quad \eta_d^{ve} = -.0859/A_{ij}$$

$$\eta_y^{ce} = 2.1111 \quad ; \quad \eta_d^{ce} = -.9776$$

Thus the constant elasticity model seems to approximate elasticities properly only when migration shares (A_{ij}) are in the neighborhood of 8.75%.⁴ While the mean sample value of A_{ij} is .10, it ranges between .0016 and .61, thus implying a substantial variation for both income and distance elasticities. These results are illustrated in figure 1.

Figure 1.
Migration - Allocation Elasticities of the VE and CE Models
with Respect to Incomes and Distance



World Bank - 21176

⁴This is derived as follows: $\eta_y^{ve} = \eta_y^{ce} \rightarrow A_{ij} = .1832/2.1111 = .087$. Similarly, $\eta_d^{ve} = \eta_d^{ce} \rightarrow A_{ij}$.

Comparison of the estimated coefficients in Table 1 with previous studies incorporating the alternative opportunities hypothesis is not a simple matter, as other studies have used different specifications and additional variables. It may thus be of interest to apply the "best alternative opportunity" formulation of the Levy-Wadycki studies to the present set of data. As mentioned earlier, their approach suggests that given the distance D_{ij} between the origin and the destination, only provinces whose distance from the origin is not larger than D_{ij} are potential alternatives for the destination actually chosen. From these potential alternatives, the best alternative (i.e., the one with highest income) is selected to represent alternative opportunities.⁵

Denoting the alternative opportunities variable calculated in this fashion by Z_{ij} , both the VE and the CE specifications were used. The results are reported in Table 2.

TABLE 2
ESTIMATION RESULTS USING A
"BEST ALTERNATIVE OPPORTUNITY" CONCEPT

Variable	VE model	CE model
Constant	.2018 (8.37)	-1.4945 (-4.69)
Y_j	.2037 (11)	2.3084 (5.24)
D_{ij}	-.0966 (-8.34)	-.917 (-5.99)
Z_{ij}	.0448 (1.36)	-.8570 (-1.97)
S	.2847 (10.92)	1.3911 (4.04)
R^2	.8065	.6061
DF ^b	105	105

^aAll explanatory variables except S are transformed into natural logarithms.

^bDegrees of freedom.

^cFigures in parentheses are 't' values.

Again, as with the earlier results of Table 1, the variable elasticity model seems to be more appropriate if the R^2 is used as a guide. However, the estimate for the VE version indicates

⁵One technical problem which has to be faced occasionally when this procedure is used pertains to the cases when no alternative location has a distance smaller than or equal to D_{ij} . This occurs in 11 instances within the present sample of 110 observations. The solution adopted here, as suggested by Levy and Wadycki [5, footnote 20], is to use the destination income as an alternative opportunity, but this is obviously an arbitrary solution.

that the "best alternative opportunity" variable Z_{ij} does not adequately capture the impact of alternatives as it has the wrong sign, and in fact its coefficient is not significantly different from zero at a 5% (one-sided) test. The results are better with the constant elasticity model where all variables have the proper sign and are statistically significant. The overall performance of the CE model with the "best alternative" concept is similar to that of the weighted "average alternative opportunity" procedure suggested above. Comparing the magnitudes of coefficients for the CE models of Tables 1 and 2, a striking difference is evident. While the destination income coefficients are quite similar, the alternative opportunities coefficient under the "best alternative" hypothesis is significantly smaller in absolute terms (about 37% of the destination income coefficient), implying (if the model is accepted) that such opportunities are not as important as implied by the average opportunities model. The absolute elasticity with respect to distance is slightly higher with the best opportunity version, but the difference is not too significant. More pronounced differences are observed regarding the impact of the Seoul dummy and the magnitude of the constant.

What conclusions should be drawn for the comparison of the "best alternative" approach to the "average alternative" approach? In the Korean context, a-priori considerations would tend to favor the latter: Inspection of Korean migration patterns reveals that in many cases there are several attractive alternatives to a given destination, thus consideration of only one (although best) alternative may be a source of bias. Moreover, even when a given destination is fairly close to an origin, substantial migration flows to more distant locations are observed in a number of cases, thus the exclusion of such locations from the list of alternative opportunities is not justified. This may be the reason for the poor performance of the "best alternative" version in the variable elasticity model, as compared to the plausible results obtained for the "average alternatives" model. On the other hand, the former formulation should not be considered as a useless approach, as the results of the constant elasticity version here and in previous works are quite reasonable.

IV. Summary

This paper emphasizes the relevance of alternative opportunities in migration theory and suggests a method of representing such opportunities in empirical studies. The proposed approach aggregates the various alternatives using a weighting system which gives smaller weights to more distant locations. Using Korean migration data, a migration-allocation model is estimated incorporating the proposed measure for alternative opportunities. The results support the suggestions made, as the coefficient for alternative opportunities is statistically significant, and, as hypothesized, has a negative impact on migration allocation between any given origin and destination. Moreover, the estimated absolute size of the coefficient is not significantly different from that of the destination income coefficient thus reaffirming the assertion that it should not be ignored in migration studies. These results are derived from both a double-log (constant elasticity) and

semi-log (variable elasticity) specifications of the migration function, although the latter is shown to be a more appropriate model, as earlier studies of Korean migration have indicated.

Appendix: Data Sources and Methods of Calculation

1. Migration Rates: There are 11 provinces in Korea. A complete table of interprovincial gross migration flows for the year 1974 is reported in the "1974 Yearbook of Migration Statistics" (Bureau of Statistics, Government of Korea, pp. 128-129). From this table the relative distribution of migration out of any province was calculated. Altogether 110 observations (10×11) are generated.
2. Destination Income: Mera [6, Table 12, p. 32] has calculated per capita gross provincial product figures for Korea covering the period 1963-1974. These are reported in index numbers for each year, where the base for the index is the province with lowest per capita output. As the explanatory variables are introduced in a logarithmic format, it does not matter whether the variables are in terms of index numbers or absolute levels. The 1973 income data were considered as most appropriate for explaining 1974 migration, as the assumption of instantaneous transmission of information is not reasonable.
3. Distance: Since the paper deals with inter-provincial migration rather than point to point migration, the distance concept is not straightforward. Other studies have used in such circumstances the distance between principal cities. But in Korea there are a number of provinces with more than one relatively large city. In addition many migrants come from concentrations of rural population. Thus the distance concept used here uses as a proxy for average distance traveled the number of miles between the approximate geographical centers of the eleven provinces (i.e., the "middle" point of the province). This approximation seems satisfactory in view of the strong statistical significance of the distance parameter in the regression equations reported in the text.
4. The alternative opportunities income variable: Using the procedures described in detail in the text, income and distance values from the sources mentioned above were combined to calculate the alternative opportunities variables.
5. Inferences about Korean distribution of educational institutions and student population were made using the "Korea Statistical Yearbook 1976" (Government of Korea, Table 234: "Summary of School by Province.") Population figures were available from the same source.

REFERENCES

1. Alperovich, G., J. Bergsman and C. Ehemann, "An Econometric Model of Migration Between U.S. Metropolitan Areas," Urban Studies 14, (February 1977), pp. 135-145.

2. Bright, M. L. and D. S. Thomas, "Interstate Migration and Intervening Opportunities," American Sociological Review 6 (December 1941) pp. 773-783.
3. Feder, G., "Alternative Opportunities and Migration: An Exposition," Annals of Regional Science, Vol. XIII, #3.
4. Isbell, E. C., "Internal Migration in Sweden and Intervening Opportunities," American Sociological Review 9 (December 1944), pp. 627-639.
5. Levy, M. B. and W. J. Wadycki, "What is the Opportunity Cost of Moving? Reconsideration of the Effects of Distance on Migration," Economic Development and Cultural Change 22 (January 1974), pp. 198-214.
6. Mera, K., Population Distribution Policies in the Republic of Korea, World Bank 1977, Washington, D.C.
7. Miller, E., "A Note on the Role of Distance in Migration: Costs of Mobility Versus Intervening Opportunities," Journal of Regional Science 12 (December 1972), pp. 475-478.
8. Renaud, B., "The Economic Determinants of Internal Migration in Korea," Applied Economics 9 (November 1977) pp. 307-318.
9. Sjaastad, L. A., "The Costs and Returns of Human Migration," Journal of Political Economy 70 (supplement 1962), pp. 80-93.
10. Stouffer, S.A., "Intervening Opportunities: A Theory Relating Mobility and Distance," American Sociological Review 5 (December 1940), pp. 845-867.
11. Stouffer, S. A., "Intervening Opportunities and Competing Migrants," Journal of Regional Science 2 (April 1960), pp. 1-26.
12. Strodtbeck, F. L., "Equal Opportunity Intervals: A Contribution to the Method of Intervening Opportunity Analysis," American Sociological Review 14 (August 1949), pp. 490-497.
13. Wadycki, W. J., "Alternative Opportunities and Interstate Migration: Some Additional Results," Review of Economics and Statistics 56 (May 1974), pp. 254-257.
14. Wadycki, W. J., "A Note on Opportunity Costs and Migration Analysis," Annals of Regional Science 8 (February 1974), pp. 109-117.
15. Bureau of Statistics, Korea, Yearbook of Migration Statistics 1974, Seoul, Korea.
16. _____, Korea Statistical Yearbook 1976, Seoul Korea.